Ersatzblatt

RING FILTER MADE OF STAR-SHAPED FOLDED FILTERING MATERIAL

Sub A2

~~The invention concerns a ring filter made of star-shaped folded filtering material according to the preamble of~~ patent claim 1.

A ring filter of this type is known from EP 0 498 757 A1.

The invention concerns itself with the problem of designing the closure on the front side in the ring filter according to the preamble, particularly using a foamed, elastic plastic closure material, so it is durable, as well as allowing an economical production of the closure region of this type of filter through an appropriate design of the closure region. In addition, a constructive design is to be provided in the closure region on the front side which ensures a secure and tight attachment of the closure material to the folded filtering material.

Sub A3

~~This problem is solved by the implementation of a ring filter according to the preamble according to~~ the characterizing features of patent claim 1.

Advisable embodiments are the object of the sub-claims and will be described in more detail with reference to an illustrated exemplary embodiment.

The following particular advantages arise through the solution according to the invention.

Particularly in ring filters having large dimensions, such as in ring filters which are, for example, intended as air filters for commercial vehicles, and in which the closure material consists of a foamed plastic material having elastic properties, not only is expensive plastic material saved by the plate-shaped insert, but the closed ring filter floor can be reliably protected from oscillations of

the floor, which cause unpleasant noises, by the selection of a stiff material for the plate-shaped insert. These types of floor oscillations can, as a rule, not be avoided with a continuous floor made of foamed, elastic plastic material.

The connection of the plate-shaped insert into the closure on the front side of the ring filter element allows an economic production of the filter, because the plate-shaped insert can be inserted together with the ring filter element and the tubular frame present therein into the mold, in which the closure on the front side is molded onto the filtering material, including the tubular frame supporting the material.

If a connection of the plate-shaped insert to the tubular frame is selected in which the plate-shaped insert is fixed axially inside the tubular frame, a particularly durable attachment of the plate-shaped insert in the molded-on closure material is ensured. The connection region is then not subjected to floor oscillations during operation of the filter.

A precise production of the ring filter in regard to its length is allowed by axial fixing of the plate-shaped insert on the tubular frame of the ring filter. More detail is provided on this matter in the description of the exemplary embodiment.

The drawing illustrates an exemplary embodiment.

Fig. 1 shows a ring filter element, partially in a view, partially in a longitudinal section,

Fig. 2 shows a detail II from Fig. 1,

Fig. 3 shows a section along line III-III in Fig. 4 through a plate-shaped insert implemented as a circular disk,

Fig. 4 shows a view of the circular disk in the direction of the arrow IV in Fig. 3,

Fig. 5 shows a view of the circular disk in the direction of the arrow V in Fig. 3.

The ring filter shown in Fig. 1 comprises star-shaped folded filtering material 1, which is supported radially on the inside on a radially permeable tubular frame 2, as well as coverings on its front side. These coverings are, on a front side, a centrally open, ring-shaped closure 3 made of molded-on polyurethane, with the polyurethane enclosing the adjoining end of the tubular frame 2.

The opposite front side of the ring filter is covered with a closed end disk 4. The radial outside of this end disk 4 consists, in the region covering the filtering material 1, of plastic 5 molded on as polyurethane and, molded into the polyurethane in the center, on the radial inside, a circular disk 6 made of another relatively stiff plastic. This plastic can, for example, be recycled material. On the radial outside, the filtering material is covered with a ring-shaped grid 7 which is embedded in the front side plastic closures.

The circular disk shown in detail in Figs. 3 to 5 has axially aligned flexible tongues 8 with barbs 9 molded onto their ends. On the side of the circular disk 6 onto which the flexible tongues 8 are molded, there are axially projecting supports 10 distributed around the circumference. To connect the circular disk 6 with the tubular frame 2, the circular disk 6 having the supports 10 is placed on the tubular frame 2 so it is stopped axially

by the frame and is axially fixed so that it does not move in recesses of the tubular frame 2 via the flexible tongues 8 which elastically engage in the recesses.

The outer diameter of the circular disk 6 is smaller than the inner diameter of the star-shaped folded filtering material 1, which results in a ring gap interval being provided between the edge of the circular disk 6 and the filtering material 1.

A filter according to the invention is preferably produced as follows.

A ring-shaped filter star is produced from filtering material 1, whose outside is coated with a grid 7. The tubular frame 2 is introduced radially into the inside of the filtering material 1. The circular disk 6 is already axially secured in this tubular frame 2 when it is introduced into the ring-shaped filtering material 1.

First, the end disk which remains open in the center is molded onto the ring filter prepared in this way. The material for this end disk is polyurethane, whose liquid starting components are poured into a mold for foaming. The end of the prepared ring filter whose open end disk is to be implemented is placed in this mold. In the mold, into which the components for the polyurethane to be foamed are poured in as liquids, the ring filter is supported exclusively over localized small regions over the front side of the filtering material 1 on supporting elements.

The support in the mold is of a type such that the end disk consisting of polyurethane can be implemented by foaming of the liquid starting components. The tubular frame 2 has, on the end facing this open end disk, a ring shoulder 11 which receives the front side of the filtering material axially, so that in this way the tubular frame 2 assumes a position

exactly defined axially relative to the filtering material 1.

In a subsequent production step, the closed end disk 4 is implemented on the opposite front end of the ring filter, where it is to be affixed. For this purpose, the appropriate front side of the prepared ring filter is placed into a mold, which was previously filled with the starting components for a polyurethane to be foamed. The ring filter is supported in this mold via the axially defined circular disk 6 connected with the tubular frame 2. The support of the circular disk 6 in the casting mold is of a type such that the circular disk 6 can only be embedded and/or enclosed by the foaming polyurethane in an outer radial region. A ring collar 12, which points to the inside of the ring filter and which is formed onto the ring disk 6, ensures that the polyurethane rising from the floor of the casting mold can rise as intended into a ring gap between the circular disk 6 and the filtering material 1.

On the surface of the circular disk 6 which comes to rest axially outward, a peripheral ring groove 13 is provided radially on the outside to achieve a labyrinth seal relative to the polyurethane foam. The supports 10, on which the tubular frame 2 rests axially, ensure radial through openings into which the foaming polyurethane can flow for at least axial contact on the ring collar 12.

Due to the alignment of the prepared ring filter by means of the circular disk 6 in the casting mold for foaming with polyurethane, an absolutely equal installation length of the ring filter can always be achieved, independent of the axial length tolerances of the filtering material.

The circular disk 6 can be provided radially on the outside with radially extending fingers 14 which are affixed as far as possible axially on the surface which comes to rest

axially on the outside in the ring filter. The filtering material 1 can press against these fingers 14 if the closed end disk 4 is molded onto the ring filter before the open end disk. However, these types of fingers 14 have the disadvantage that a circular disk 6 provided with them cannot be introduced together with the tubular frame 2 into the central cavity of the filtering material 1 if it is already connected with the tubular frame.

In order that the tubular frame can be introduced without complications into the central cavity inside the star-shaped folded filtering material 1, the edge of the tubular frame introduced is provided with an introduction bevel around its circumference.

The ring filter described is an air filter having an axial length of 460 mm and an outer diameter of 310 mm for a commercial vehicle. The diameter of the plate-shaped insert, i.e. the circular disk 6, visible from the outside is 170 mm for an actual outer diameter of the circular disk of 185 mm.

CLAIMS

1. Ring filter made of star-shaped folded filtering material and a closure molded onto one of its two front sides as a closed end disk having a plate-shaped insert, which forms a central region of the closure lying radially inside the filtering material, made of a material different from the other closure material,

   characterized by the features,

   - a radially permeable tubular frame (2), which extends approximately over the entire axial length of the ring filter, adjoins the filtering material (1) radially on the inside,

   - the plate-shaped insert (6) is in contact with the tubular frame (2),

   - the closure material (5) is a foamed plastic.

2. Ring filter according to claim 1,

   characterized in that

   the closure material (5) is a polyurethane foam.

3. Ring filter according to claim 1 or 2,

   characterized in that

   the plate-shaped insert (6) is interlocked with the tubular frame (2).

4. Ring filter according to one of the preceding claims,

   characterized in that

the plate-shaped insert (6) is connected with the tubular frame (2) so that it is axially fixed.

5. Ring filter according to one of the preceding claims,

characterized by the features

- the plate-shaped insert (6) is a circular disk having an outer diameter smaller than the inner diameter of the filtering material,

- the radial outside of the plate-shaped insert (6) extends axially into the region of the filtering material (1),

- when it is connected with the tubular frame (2), the axial distance ranges of the plate-shaped insert (6) distributed around the circumference are approximately uniform relative to the tubular frame (2).

6. Ring filter according to one of the preceding claims,

characterized in that

the plate-shaped insert (6) has a ring collar (12) projecting in the direction of the tubular frame (2) radially outward relative to its position to be assumed on the tubular frame (2).

7. Ring filter according to one of the preceding claims,

characterized in that

the plate-shaped insert (6) has radially projecting fingers (14) radially outside for an axial stop on the filtering material (1).

8. Ring filter according to one of the preceding claims,

characterized in that

the fingers (14) are located in the lower floor region and have an extremely small axial dimension relative to the height of the radial outer surface of the plate-shaped insert (6).

9. Ring filter according to one of the preceding claims,

characterized in that

axial supports (10) are provided on the ring collar (12) for an axial stop on the tubular frame (2).

10. Ring filter according to one of the preceding claims,

characterized in that

the plate-shaped insert (6) is provided with radially elastic flexible tongues (8), projecting axially from this insert (6) in the direction of the tubular frame (2), to achieve an interlocking connection with the tubular frame (2), with the flexible tongues being implemented as barbs (9) on their free end for axial fixing on the tubular frame (2).